

Oscillographs, Accessories, & Galvanometers

**MIDWESTERN
INSTRUMENTS** / **TELEX**

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Composite Catalog

Oscillographs, General and Special Purpose
Models 800, 801, 1200, 1210, 621-HT, 621-S

Models 102, 120, 131 Galvanometers
Model 112A Carriers



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Midwestern Instruments, Inc., was founded in 1950, and almost immediately became the state-of-the-art leader in the oscillography field. While oscillographs were the original product of the corporation, we quickly diversified into Digital and Analog Magnetic Tape Recording.

The original oscillograph products were designed specifically for use by the Geophysical Industry. These instruments became so popular that Midwestern Instruments soon found it necessary to create new units to meet the needs of Space Age, Medical and Industrial Applications. Midwestern Instruments is justly proud of its many innovations in the field of oscillography, among which are the following:

- 1) The original concept in an oscillograph for torpedo applications.
- 2) The development of original tubular hermetically sealed galvanometer.
- 3) The first 12" direct writing recorder using direct print paper.
- 4) The first company to develop real multiplex electronics-electronic flash timing for an oscillograph.
- 5) First 12" direct/writing/record oscillograph for flight test purposes which was qualified to MIL-E-5400.
- 6) First oscillograph of any type to be assigned a MILSpec number-MIL-O-23560.

The proven performance of Midwestern Oscillographs under extreme environmental conditions — up to 3,000 gravities of acceleration, temperatures from — 65 to + 165°F, altitude to 100,000 feet — plus a wide range of vibration atmospheric contamination, humidity, and other special requirements — and over many years of uninterrupted reliability of operation, are continuing testimony to the excellence of design and manufacturing precision built into every Midwestern oscillograph recorder.

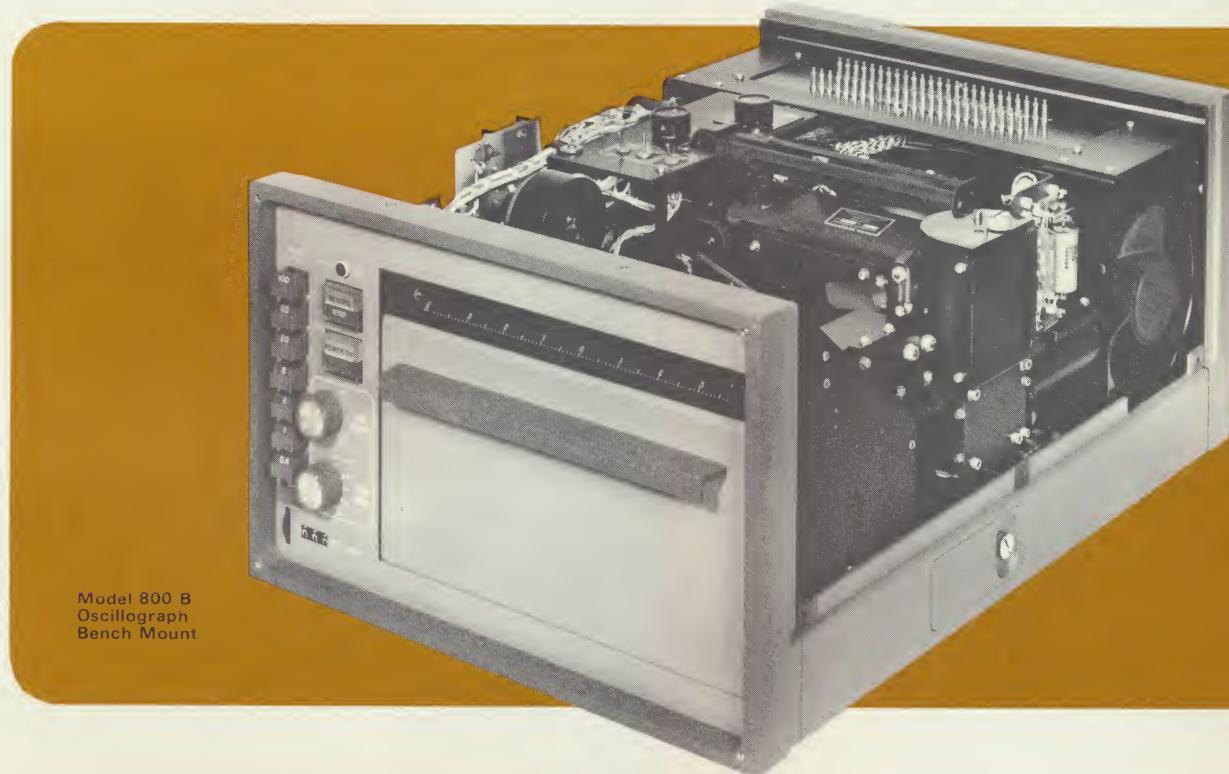
Complementing the line of oscillographs, Midwestern offers its high performance sub-miniature galvanometers with frequency response extending from DC to 15,000 Cycles. The rugged, dependable Midwestern galvanometer is widely acknowledged as the unchallenged leader in the field of light beam oscillography. Years of practical engineering and delicate manufacturing skill have resulted in a galvanometer many times copied, but never duplicated. Applied to a Midwestern oscillograph recorder, the galvanometers produce highly defined traces in precise duplication of input signals, often with sensitivities that require no further signal amplification from the driving source.

We at Midwestern gladly invite your inspection of our facilities and instruments to prove to yourself that we have earned our motto of "Look With Confidence To Midwestern For Proven Leadership In Oscillography."

The Superior

MIDWESTERN

MODEL 800
OSCILLOGRAPH



Model 800 B
Oscillograph
Bench Mount

The Midwestern 800 Series direct-recording Oscillograph is a general purpose, industrial-laboratory type recorder, available in various configurations: bench mount (shown above); rack mount (p. 4); and with or without the 800TR paper take-up unit and latensifier (also shown on page 4). These units available with 8, 14, 18, 25 or 36 active recording channels.

The Model 800 offers maximum versatility and adaptability through exclusive modular design of basic component assemblies and optional accessories. Thus, the basic oscillograph contains all the mounting holes, electrical circuit terminals, jack shafts and power requirements for adding optional accessories in the field.

PHYSICAL DATA

Dimensions: The unit dimensions exclude knobs, connector extensions, and mounting feet.

HEIGHT.....	BENCH UNIT	RACK UNIT
8-3/8"	8-3/4"	
WIDTH.....		19"
LENGTH.....		20"
WEIGHT.....		
COLOR.....		

8-3/8"	8-3/4"
13-1/2"	19"
19-1/8"	20"

The weights given are for a 25-channel oscillograph with a complete complement of all standard and optional features:

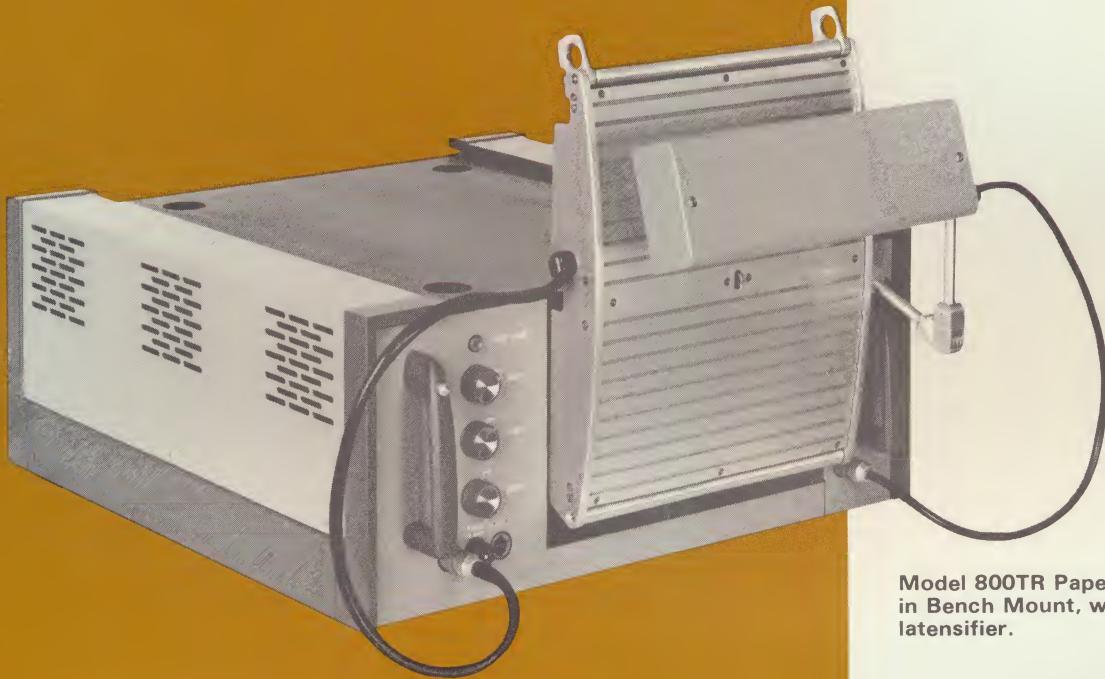
BENCH UNIT — 68 pounds.
RACK UNIT — 74 pounds.

Standard units will be furnished in two-tone green unless otherwise specified. Non-standard colors are available on special order at an additional price with delivery subject to special quotation.

EXCLU



Model 800B Oscilloscope
in Bench Mount, closed.



Model 800TR Paper Take-Up Unit
in Bench Mount, with single
latensifier.



Model 800R Oscilloscope
in Rack Mount, closed.

EXCLUSIVE DESIGN FEATURES & GENERAL SPECIFICATIONS

MODEL 800 OSCILLOGRAPH

Exclusive Modular Features For Easy Field Modification!

- Consecutive Trace Numbering Module
- Automatic Record Length Module
- Plug-in Lamp Power Supply Module
- Record Identification and Event Marker Module
- Plug-in Timing Interval Circuit

General Specifications

ACTIVE DATA CHANNELS.....	8, 14, 18, 25 or 36 channel models optional.
RECORDING MEDIA.....	8 inch wide, direct print paper, specification 1, 250 feet standard base or 475 feet thin base.
RECORDING SPEEDS.....	Basic: 0.1, 0.4, 1, 2, 5, 20, 50 & 100 inches/second. Optional: 0.05-50 ips, 0.15-150 ips, 0.1-100 cm/sec.
SPEED SELECTION.....	Eight individual pushbuttons or remote contact closure.
GALVANOMETER LAMP.....	3 electrode, 100 watt, Mercury arc lamp, or 3 electrode, 75 watt, Xenon arc lamp, optional.
GALVANOMETER LAMP CONTROL.....	Automatic starting; regulated lamp power supply.
TRACE WRITING SPEED.....	75,000 inches per second.
TRACE WIDTH CONTROL.....	Front panel adjustable to less than 0.02 inches.
TRACE BLANKING.....	Manual rotation of galvanometer barrel 180 degrees.
TRACE IDENTIFICATION.....	Sequential interruption, 16 inch cycle, 0.025" break.
SPOT SETTING & VIEWING.....	Direct view spot contact with calibrated setting scale.
GRID LINES.....	0.1 inch or 2 mm spacing, every 5th line accentuated.
GRID LINE INTENSITY.....	Manual control, continuously variable to full OFF position.
OPTICAL ARM.....	12 inches nominal at zero trace deflection.
GALVANOMETER FOCAL LENGTH.....	5.5 inches nominal.
TEMPERATURE CONTROL.....	100° F, thermostatically controlled magnetic structure.
INPUT CONNECTORS.....	Amphenol series 222, data signals and remote controls.
GALVANOMETER ISOLATION.....	Floating input, 10,000 megohms to adjacent channels and instrument ground.
GALVANOMETER PROTECTION.....	Internal shunt and series resistor terminals.
PAPER LOADING.....	Drop-in direct paper loading without spools.
PAPER INDICATORS.....	Direct footage counter and paper low warning light.
MAXIMUM SIGNAL POTENTIAL.....	600 volts peak AC common mode, standard galvos.
INSTRUMENT POWER.....	115 or 220 VAC, 50/60 cycle, 400 watts maximum.
LOCAL/REMOTE OPERATION.....	Local/remote operation of all basic control functions selectable by operator.

Optional Features

ELECTRONIC FLASH TIMING.....	Full width, 0.01, 0.1, 1 & 10 second and external sync.
TRACE NUMBERING.....	Recorded on left margin opposite trace interruptions.
RECORD/EVENT IDENTIFICATION.....	Four digit counter or 24-hour real time clock, on right margin.
AUTO RECORD LENGTH CONTROL.....	Selectable, 1-25 foot record length stop control.
INDIVIDUAL GALVO INPUTS.....	3 pin, Cannon XLR series connectors, rear panel mount.

Environmental specifications identical to model 1200, (See page 9)

The Remarkable

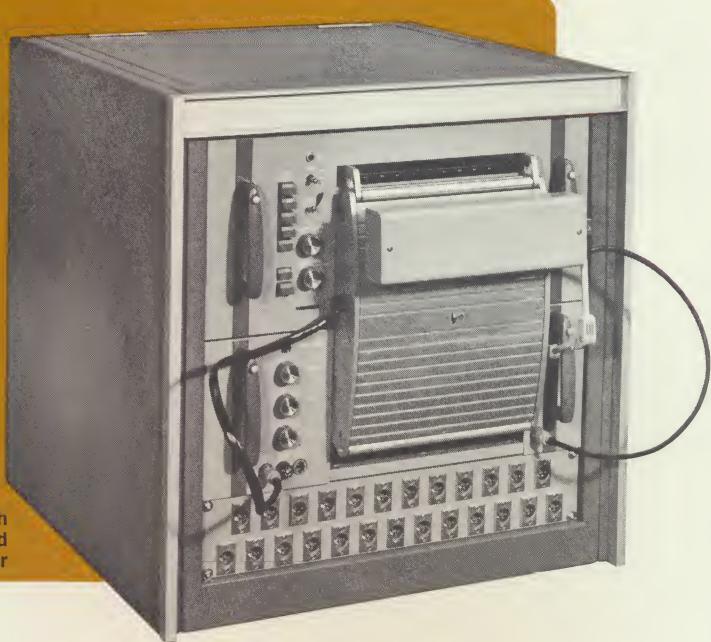
MODEL 801
OSCILLOGRAPH

MIDWESTERN



Model 801 R
Oscillograph
Rack Mount

Model 801 R with
Model 801 TR Take-up unit and
single lamp latensifier



The Midwestern 801 direct-recording Oscillograph is a general purpose, industrial-laboratory type recorder which combines versatility and economy without compromising instrument performance. These units are available with 8, 14, 18, 25 or 36 active data recording channels, and may be ordered in a variety of configurations.

The Model 801 incorporates the same modular design features found throughout the Midwestern line which enable the operator to alter the configuration of the instrument in the field, through the addition of optional accessories or the substitution of basic, plug-in components, such as the lamp housing assembly. Note: Galvanometers and plug-in lamp housing assembly available through top access door.

PHYSICAL DATA

Dimensions: The unit dimensions exclude knobs, connector extensions, and mounting feet.

	BENCH UNIT	RACK UNIT*
HEIGHT	9"	8 ³ / ₄ "
WIDTH	13 ⁵ / ₈ "	19"
LENGTH	19 ¹ / ₂ "	20 ³ / ₄ "
WEIGHT		

The weights given are for a 36-channel oscillograph with a complete complement of all standard and optional features:

BENCH UNIT — 65 pounds.
RACK UNIT — 75 pounds.

COLOR

Standard units will be furnished in two-tone green unless otherwise specified. Non-standard colors are available on special order at an additional price with delivery subject to special quotation.

*Fits standard EMA 19 inch rack.

The patented features and superior craftsmanship of Midwestern Galvanometers provide maximum frequency response, from DC to 15,000 cps. Specifications — Page 15.

DESIGN FEATURES & GENERAL SPECIFICATIONS

MODEL 801 OSCILLOGRAPH

General Specifications

ACTIVE DATA CHANNELS	8, 14, 18, 25, 36 channel models optional.
RECORDING MEDIA	8 inch wide, direct print paper, specification 1.
RECORDING SPEEDS	Basic: .125, .25, .5, 1, 2, 4, 8, 16, 32, 64 inches/second. Optional: .25 to 128 inches per second. .5 to 150 centimeters per second. 1 to 300 centimeters per second. 5 to 1500 millimeters per second. 10 to 3,000 millimeters per second.
SPEED SELECTION	10 speeds, 5 speed pushbuttons and two pushbutton range multipliers.
GALVANOMETER ILLUMINATION	3 electrode, 100 watt Mercury arc lamp, or 3 electrode, 75 watt Xenon arc lamp, optional.
GALVANOMETER LAMP CONTROL	Automatic starting, regulated lamp power supply.
TRACE WRITING SPEED	50,000 inches per second, minimum.
TRACE WIDTH CONTROL	Front panel adjustable to less than 0.02 inches.
SPOT SETTING AND VIEWING	Direct view spot contact with calibrated setting scale.
GRID LINES	0.1 inch or 2 mm spacing, every 5th line accentuated.
GRID LINE INTENSITY CONTROL	Manual, continuously variable to full OFF position.
TRACE IDENTIFICATION	Sequential interruption, 0.06 inch break.
OPTICAL ARM	12 inches nominal at zero trace deflection.
GALVANOMETER FOCAL LENGTH	5.5 inches nominal.
TEMPERATURE CONTROL	100°F, thermostatically controlled magnetic structure.
INPUT CONNECTORS	Amphenol series 222, data signals and remote control.
GALVANOMETER ISOLATION	Floating input, 10,000 megohms to adjacent channels and instrument ground.
GALVANOMETER PROTECTION	Internal shunt and series resistor terminals.
PAPER LOADING	Drop-in direct paper loading without spools.
PAPER INDICATORS	Percent full roll of paper remaining meter.
MAXIMUM SIGNAL POTENTIAL	600 volts peak AC, common mode, standard galvos.
INSTRUMENT POWER	115 or 220 VAC, 50/60 cycle, 550 watts maximum.

Optional Features

ELECTRONIC FLASH TIMING	Full width, 0.01, 0.1, 1 & 10 second and external sync.
TRACE NUMBERING	Recorded on left margin opposite trace interruptions.
INDIVIDUAL GALVO INPUTS	3 pin, Cannon XLR series connectors, rear panel mount.

Environmental Specifications

OPERATING TEMPERATURE	32 to 120 degrees Fahrenheit.(0 to 50 degrees C)
STORAGE TEMPERATURE	-65 to 165 degrees Fahrenheit.(-50 to 75 degrees C)
ALTITUDE	10,000 feet for reliable lamp operation.
OPERATING HUMIDITY	85% up to 105 degrees Fahrenheit.
STORAGE HUMIDITY	100% up to 105 degrees Fahrenheit for 12 hours.
TEMPERATURE CHANGE RATE	3 degrees F per minute within operating range.

Standard Accessories

All instruments are supplied complete with galvanometer tools, mating connectors for both signal and remote control, power cord, and a full complement of dummy magnetic flux plugs for use in unoccupied recording channels.

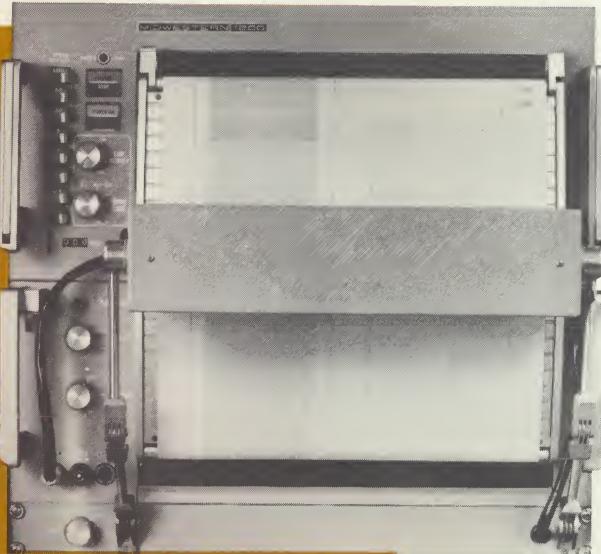
MODEL 1200
OSCILLOGRAPH

The Versatile

MIDWESTERN



Model 1200 R
Oscilloscope
Basic Rack-Mount



Model 1200B Bench Mount with
Model 1200TR Take-Up Unit and
single latensifier lamp

The Midwestern Model 1200 direct-recording optical Oscilloscope offers a new concept in low-cost, high volume, data acquisition with a full range of recording capability for both system applications and laboratory use.

With 12 inch chart width and up to 50 active data recording channels, the Model 1200 provides basic performance comparable to instruments in a much higher price range. Its 475 feet paper capacity and maximum recording speed of 150 inches per second permit the acquisition of very high frequency data signals for a duration in excess of 6 minutes. At minimum speed, the recording duration is extended to more than 32 hours.

Like the smaller Model 800, the Model 1200 is highly modular in design for ease of field modification. While the 1200 is primarily designed for rack mounted installation, it may be used as a bench instrument by mounting in an accessory cabinet. A separate Model 1200 TR paper take-up accessory is also available for spooling exposed record at all speeds and may also be used with a Model 1200 L latensification and viewing lamp accessory.

PHYSICAL DATA

WIDTH	19 inches, standard EMA rack mounting configuration.
HEIGHT	8 $\frac{3}{4}$ inches, standard EMA panel space clearance.
LENGTH	20 $\frac{3}{4}$ inches overall, including front handles. 18 $\frac{3}{4}$ inches behind mounting, standard unit. 20 inches behind mounting, individual inputs. 2 inch rear clearance for connectors recommended.
WEIGHT	85 pounds, including slides and dust cover.
COLOR.....	(As noted on page 3, this catalog)

The patented features and superior craftsmanship of Midwestern Galvanometers provide maximum frequency response, from DC to 15,000 cps. Specifications — Page 15.

DESIGN FEATURES & GENERAL SPECIFICATIONS

MODEL 1200 OSCILLOGRAPH

General Specifications

ACTIVE DATA CHANNELS	16, 28, 36 or 50 channel models optional.
RECORDING MEDIA	12 inch wide, direct print paper, specification 1 or 2. 250 feet standard base or 475 feet thin base.
RECORDING SPEEDS	Basic: 0.1, 0.4, 1, 2, 5, 20, 50 & 100 inches/second. Optional: 0.05-50 ips, 0.15-150 ips, 0.1-100 cm/sec.
SPEED SELECTION	Eight individual pushbuttons or remote contact closure.
GALVANOMETER ILLUMINATION	3 electrode, 100 watt, Mercury arc lamp, or 3 electrode, 75 watt, Xenon arc lamp, optional. Automatic starting, regulated lamp power supply.
GALVANOMETER LAMP CONTROL	50,000 inches per second.
TRACE WRITING SPEED	Front panel adjustable to less than 0.02 inches.
TRACE WIDTH CONTROL	Direct view spot contact with calibrated setting scale.
SPOT SETTING AND VIEWING	0.1 inch or 2 mm spacing, every 5th line accentuated.
GRID LINES	Manual, continuously variable to full off position.
GRID LINE INTENSITY CONTROL	Sequential interruption, 16 inch cycle, 0.025" break.
TRACE IDENTIFICATION	12 inches nominal at zero trace deflection.
OPTICAL ARM	5.5 inches nominal.
GALVANOMETER FOCAL LENGTH	100°F, thermostatically controlled magnet structure.
TEMPERATURE CONTROL	Amphenol series 222, data signals and remote controls.
INPUT CONNECTORS	Floating input, 10,000 megohms to adjacent channels and instrument ground.
GALVANOMETER ISOLATION	Internal shunt and series resistor terminals.
GALVANOMETER PROTECTION	Drop-in direct paper loading without spools.
PAPER LOADING	Direct footage counter and paper low warning light.
PAPER INDICATORS	600 volts peak AC common mode, standard galvos.
MAXIMUM SIGNAL POTENTIAL	115 or 220 VAC, 50/60 cycle, 550 watts maximum.

Optional Features

ELECTRONIC FLASH TIMING	Full width, 0.01, 0.1, 1 & 10 second and external sync.
TRACE NUMBERING	Recorded on left margin opposite trace interruptions.
RECORD/EVENT IDENTIFICATION	Four digit counter or 24-hour clock, on right margin.
AUTO RECORD LENGTH CONTROL	Selectable, 1-25 foot record length stop control.
INDIVIDUAL GALVO INPUTS	3 pin, Cannon XLR series connectors, rear panel mount.

Environmental Specifications

OPERATING TEMPERATURE	32 to 120 degrees Fahrenheit. (0 to 50 degrees C)
STORAGE TEMPERATURE	-65 to 165 degrees Fahrenheit. (-50 to 75 degrees C)
SHOCK	10 Gs, 10 millisecond duration.
VIBRATION	10 Gs at 20 cps decreasing linearly to 3 Gs at 110 cps.
ALTITUDE	10,000 feet for reliable lamp operation.
OPERATING HUMIDITY	85% up to 105 degrees Fahrenheit.
STORAGE HUMIDITY	100% up to 105 degrees F for 12 hours.
TEMPERATURE CHANGE RATE	3 degrees F per minute within operating range.

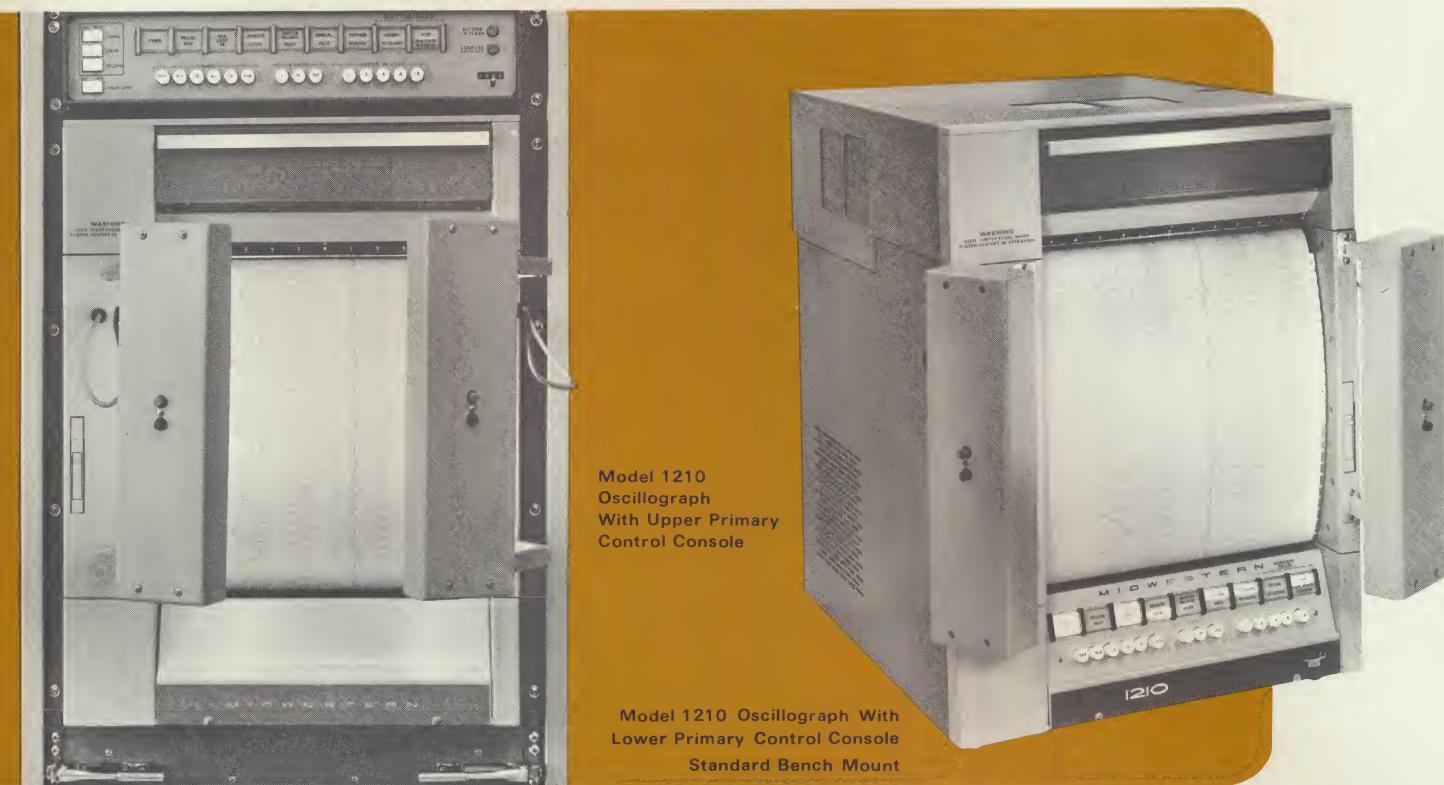
Standard Accessories

All instruments are supplied complete with galvanometer tools, mating connectors for both signal and remote control, power cord, rack slides, complete rack mounting hardware, and a full complement of dummy magnetic flux plugs for use in unoccupied recording channels.

The Ultimate

MODEL 1210
OSCILLOGRAPH

MIDWESTERN



The Midwestern Model 1210 is the newest, most advanced, and most versatile addition to a distinguished family of direct-recording optical oscillographs. Designed for maximum recording performance and operator convenience, the 50-channel 1210 incorporates as standard equipment a number of options available on other models and represents the ultimate achievement in oscillograph recorders.

Primarily designed for bench top operation, the 1210 may be rack-mounted with an accessory adapter. Other optional accessories include: Shockmount Base, Latensifier/Viewing Unit, Ambient Light Shield, RFI Qualification (specification MIL-1-6181D and MIL-1-26600 Class 1), Record Ejection Roller, Remote Control Consoles, Console Extension Cables, Special Grid Adapter, Paper Width Adapter, Console Filler Panel, and Galvanometer Limiting/Damping.

PHYSICAL DATA

Dimensions:	BENCH MOUNT	RACK-MOUNTED BENCH CONSOLE	RACK-MOUNTED RACK CONSOLE
HEIGHT	23-1/2" with legs	26-1/4"	29-3/4"
WIDTH	17-1/8"	19" or 24"	19" or 24"
DEPTH	21"	21"	21"
WEIGHT	175 pounds	190 or 200 lbs.	200 or 210 lbs.
COLOR	(As noted on Page 3, this catalog)		

The patented features and superior craftsmanship of Midwestern Galvanometers provide maximum frequency response, from DC to 15,000 cps. Specifications — Page 15.

DESIGN FEATURES & GENERAL SPECIFICATIONS

MODEL 1210 OSCILLOGRAPH

General Specifications

ACTIVE DATA CHANNELS.....	50 active data recording channels provided.
RECORDING MEDIA.....	12 inch wide direct print paper and photographic papers, spooled to specification 28. 250 feet standard base or 475 feet thin base. Optional widths.
RECORDING SPEEDS.....	15 push button, switch-selected forward speeds from 0.1 to 160 ips; 3 ranges X1, X10, X100; 5 basic settings, 0.1, 0.2, 0.4, 0.8 & 1.6 ips; 13 reverse speeds from 0.1 to 40 ips.
GALVANOMETER ILLUMINATION.....	3 electrode, 100 watt, Mercury arc lamp, or 3 electrode, 75 watt, Xenon arc lamp, optional.
GALVANOMETER LAMP CONTROL.....	Automatic starting regulated lamp power supply.
TRACE INTENSITY CONTROL.....	Automatic aperture control activated by selection of recording speed; and manual override.
TRACE WRITING SPEED.....	50,000 inches per second.
TRACE WIDTH CONTROL.....	Adjustable down to .012 inch, depending on writing speed.
TRACE BLANKING.....	Manual rotation of galvanometer barrel 180°
SPOT SETTING AND VIEWING.....	Direct view spot contact with calibrated setting scale. 0.1 inch spacing standard, every 5th line accentuated. Metric or special grids and 10th line accentuation optional.
GRID LINES.....	Manual, continuously variable; push button ON/OFF control. Sequential interruption, 12 inch cycle.
GRID LINE INTENSITY CONTROL.....	12 inches nominal at zero trace deflection.
TRACE IDENTIFICATIONS.....	5.5 inches nominal.
OPTICAL ARM.....	100° F, thermostatically controlled magnetic structure. ($\pm 5^\circ$)
GALVANOMETER FOCAL LENGTH.....	Amphenol series 222, data signals and remote controls.
TEMPERATURE CONTROL.....	Floating input, 10,000 megohms to adjacent channels and instrument ground.
INPUT CONNECTORS.....	Internal shunt and series resistor terminals.
GALVANOMETER ISOLATION.....	Drop-in direct paper loading through front sliding paper transport.
GALVANOMETER PROTECTION.....	Percentage remaining indicator and paper low warning light.
PAPER LOADING.....	600 volts peak AC common mode, standard galvos.
PAPER INDICATORS.....	115 (± 10) VAC, 50/60 cycle, 700 watts without heated platen, 1660 watts with heated platen.
MAXIMUM SIGNAL POTENTIAL.....	Full width, 0.001, 0.01, 0.1, 1 & 10 second and external sync.
INSTRUMENT POWER.....	Recorded on left margin opposite trace interruptions.
ELECTRONIC FLASH TIMING.....	Two 4-digit counters, one, internal, for optical reproduction on right margin of chart, one, external, for operator viewing.
TRACE NUMBERING.....	Selectable, 1-25 foot record length stop control.
RECORD/EVENT IDENTIFICATION.....	3 pin, Cannon XLR series connectors, rear panel mount.
AUTO RECORD LENGTH CONTROL.....	3 8-watt fluorescent tubes, gold, cool white and unfiltered.
INDIVIDUAL GALVO INPUTS.....	Thermostatically controlled heat paper platen for forced latensification.
LATENSIFIER LAMP.....	3 individual filtered, pressurized systems prevent over-heating when high-speed latensification system is operative.
HEATED PLATEN.....	
COOLING AND FILTERING.....	

Optional Features

RACK-MOUNT ADAPTER.....	Slide rack assembly for standard 19" or 24" instrument cabinet.
SHOCKMOUNT BASE.....	Isolates instrument for normal operation, while subjected to 0.06 inch peak-to-peak amplitude over frequency range from 10 to 55 cps.
LATENSIFIER/VIEWING UNIT.....	Identical to standard unit for direct mounting to oscilloscope.
AMBIENT LIGHT SHIELD.....	Opaque cover to protect photographic process papers from excessive exposure.
RECORD EJECTION ROLLER.....	Provides direct record ejection at all speeds up to 160 ips.
REMOTE CONTROL CONSOLES.....	Bench or rack-mounted, standard panel widths, 19" or 24", 3½" depth.
CONSOLE EXTENSION CABLES.....	4 similar extension cables for rear panel connection of consoles or remote units up to 25 feet.
GALVANOMETER LIMITING/DAMPING.....	Electrical damping and series limiting resistance for galvo inputs.
PAPER WIDTH ADAPTER.....	Special spool adapters available to accommodate narrower recording papers, up to 8-inch width.

Environmental Specifications

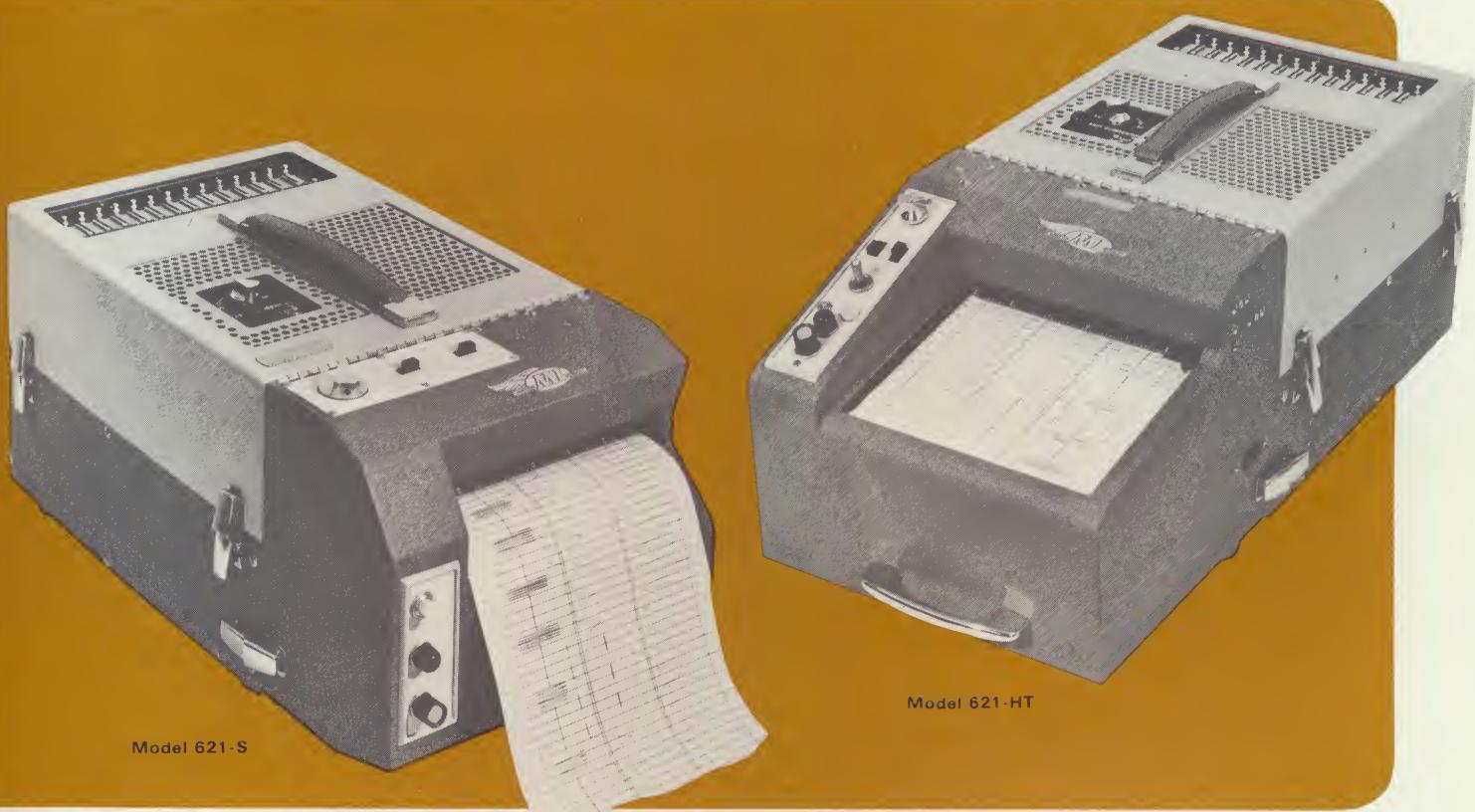
STORAGE TEMPERATURE.....	-20 deg. to 165 deg. Fahrenheit. (-29 to 75 degrees C)
SHOCK.....	5 Gs, 11 millisecond duration, on Shockmount base.

Other environmental specifications identical to model 1200, (See page 9)

The Portable

MIDWESTERN

MODEL 621
OSCILLOGRAPH



Model 621-S

Model 621-HT

The Midwestern Model 621 direct-writing optical oscillograph is specifically designed to combine operator convenience, portability, and rugged construction in a highly functional and reliable data acquisition recorder. This compact, lightweight instrument is equally at home in either general laboratory use or in field recording applications, offering up to 14 active data recording channels.

The Model 621-S provides direct record ejection without paper take-up, and incorporates all basic instrument features. The Model 621-HT is equipped with an integral paper take-up spool and horizontal record table with a six-inch viewing area.

PHYSICAL DATA

	621-S	621-HT
BENCH MOUNT HEIGHT.....	7 $\frac{1}{8}$ "	7 $\frac{7}{8}$ "
SHOCK MOUNTED HEIGHT.....	8 $\frac{1}{8}$ "	8 $\frac{5}{8}$ "
RACK MOUNTED SPACE.....	12 $\frac{1}{4}$ "	12 $\frac{1}{4}$ "
WIDTH	9 $\frac{3}{4}$ "	9 $\frac{3}{4}$ "
LENGTH	17 $\frac{1}{2}$ "	21 $\frac{1}{8}$ "
WEIGHT	41 lbs.	45 lbs.
COLOR.....	(As noted on Page 3, this catalog)	

The patented features and superior craftsmanship of Midwestern Galvanometers provide maximum frequency response, from DC to 15,000 cps. Specifications — Page 15.

DESIGN FEATURES & GENERAL SPECIFICATIONS

MODEL 621 OSCILLOGRAPH

General Specifications

ACTIVE DATA CHANNELS	Up to fourteen maximum.
RECORDING MEDIA	6 inch wide, direct print paper, specification 28, 100 feet standard base or 200 feet thin base.
RECORDING SPEEDS	Standard—0.3 to 60 inches per second. Low—0.02 to 4 inches per second. Extra Low—0.2 to 40 inches per minute.
SPEED SELECTION	Within Range—Rotary selector switch plus 10:1 jump speed control for total of 18 increments. Between Ranges—Change gears supplied with oscilloscope for convenient field conversion.
GALVANOMETER ILLUMINATION	3 electrode, 100 watt, Mercury arc lamp.
TRACE WRITING SPEED	50,000 inches per second.
TRACE WIDTH	Adjustable to less than 0.01 inches.
TEMPERATURE CONTROL	100° F, thermostatically controlled magnet structure.
OPTICAL ARM	7 inches nominal at zero trace deflection.
GALVANOMETER FOCAL LENGTH	3.5 inches nominal.
SIGNAL INPUT CONNECTOR	Amphenol 26-4401-32P instrument receptacle. Amphenol 26-4301-32S mating cable plug.
GALVANOMETER ISOLATION	Floating input, 10,000 megohms to adjacent channels and instrument ground.
MAXIMUM SIGNAL POTENTIAL	600 volts peak AC common mode.
INSTRUMENT POWER	115 VAC, 60 cycle, 500 watts maximum.

Optional Features

GRID LINES	Longitudinal reference coordinates, 0.1 inch or 2 mm spacing, every 5th line accentuated, produced optically coincident with galvanometer traces.
TIMING LINES	Full record width, synchronously driven, optical shutter timing system with selectable intervals of 0.1 and 0.05 seconds, and ON/OFF control.
TRACE IDENTIFICATION	Sequential momentary interruption of all traces at 3 inch repetition cycle, independent of speed.
INDIVIDUAL SIGNAL INPUTS	Cannon XLR-3-32 three pin instrument receptacles. Cannon XLR-3-11C three pin mating cable plugs.

Environmental Specifications

OPERATING TEMPERATURE	0 to 120 degrees Fahrenheit. (-20 to 50 degrees C)
STORAGE TEMPERATURE	-65 to 165 degrees Fahrenheit. (-50 to 75 degrees C)
SHOCK	10 Gs, 10 millisecond duration.
VIBRATION	5 Gs, 5 cps to 110 cps, with optional shockmount.
ALTITUDE	10,000 feet for reliable lamp operation.
HUMIDITY	5% to 95%.

Standard Accessories

All instruments supplied complete with galvanometer tools, recording lamp, paper spools, mating connectors, dust cover, manual, and flux plugs for unused channels.

RECORDING
GALVANOMETERS
models 102, 120, 131

MIDWESTERN

MODEL 102
GALVANOMETER



PERFORMANCE CHARACTERISTICS

THESE GALVANOMETERS ARE DIRECTLY INTERCHANGEABLE AMONG ALL MODEL 158 MAGNET STRUCTURES

TYPE NUMBER (2)	NOMINAL UNDAMPED NATURAL FREQUENCY (cps)	FREQUENCY RESPONSE FLAT \pm 5% MINIMUM RANGE (cps)	REQUIRED EXTERNAL DAMPING RESISTANCE (Ohms) (3)	NOMINAL INTERNAL RESISTANCE (Ohms)	SENSITIVITY AT 12-INCH OPTICAL ARM (4) (5)				BALANCE MAX. STATIC DEFLECTION PER "G" AT 12-INCH OPTICAL ARM (Inch)		MAXIMUM DC PEAK-TO-PEAK DEFLECTION WITH \pm 2% LINEARITY (Inches) (7)	MAX. SAFE CUR- RENT (ma)
					CURRENT \pm 5% DC-UNDAMPED		VOLTAGE DAMP 'D-SYS.'		Standard	Special (6)		
					ma/in	in/ma	mv/in	in/mv	Standard	Special (6)		
102A-40	40	0-24	350	36	.0040	250.	1.54	.649	.120	.070	6	10
102A-60	60	0-36	350	39	.0070	143.	2.72	.368	.070	.030	6	10
102A-100	100	0-60	225	34	.0098	102.	2.54	.394	.030	.008	8	25
102-150	150	0-90	145	32	.021	47.6	3.72	.269	.030	.008	8	25
102-200	200	0-120	100	28	.039	25.6	4.99	.200	.030	.008	8	50
102-300	317	0-180	80	24	.126	7.9	13.10	.076	.030	.008	8	50
102-400	420	0-240	40	24	.226	4.4	14.46	.069	.030	.008	8	50
102-500	520	0-300	20	30	.368	2.7	18.40	.054	.030	.008	8	50
126-100	100	0-60	120	27	.0106	94.3	1.56	.641	.030	.008	8	10
126-101	100	0-60	350	46	.0071	140.8	2.81	.356	.030	.008	8	10
126-200	200	0-120	120	36	.028	35.7	4.37	.229	.030	.008	8	10
126-201	200	0-120	350	72	.024	41.7	10.13	.099	.030	.008	8	10
126-300	300	0-180	120	50	.051	19.6	8.67	.115	.030	.008	8	10
126-301	300	0-180	350	51	.065	15.4	26.06	.038	.030	.008	8	10
111P-200	205	0-123	33	20	.160	6.3	8.00	.125	.030	.008	8	50
FLUID DAMPED					v/in	in/v						
102-900	900	0-540		25	3.7	.270	.092	10.8	.010		6	100
102-1000	1000	0-600		25	4.6	.217	.115	8.7	.010		6	100
102-1500	1500	0-900		15	10.7	.093	.160	6.25	.010		6	100
102-2000	2000	0-1200		15	17.5	.057	.262	3.82	.010		6	150
102-3000	3000	0-1800	(8)	14	41.0	.024	.574	1.74	.010		4	150
120B-3.5K	3500	0-2100		43	19.4	.052	.834	1.20	.010		4	100
120B-5K	5000	0-3000		43	32.4	.031	1.36	.745	.010		4	100
120B-8K	8000	0-5000		43	67.8	.015	2.91	.344	.010		2.5	100
120B-10K	10000	0-6000		43	67.8	.015	2.91	.344	.010		2.5	100
102-1		(9)	(10)	32	.0070	143.			.120		4	10
102 M	STATIC REFERENCE TRACE GALVANOMETER (DUMMY GALVANOMETER WITH MIRROR)											
102 D	DUMMY GALVANOMETER (11)											
131-15K	A HIGH-FREQUENCY GALVANOMETER WITH A FREQUENCY RANGE FROM 0 TO 15,000 cps. See Bulletin OE 1023											

NOTES:

- All values in this chart are based on a 100° F. galvanometer temperature and the Midwestern standard flux level.
- All types listed are supplied in either 5.5-inch or 3.5-inch focal length as required. Special focal lengths available between 2.5 inches to 7.0 inches.
- The total resistance of the circuit required for $65 \pm .05$ of critical damping.
- The system voltage sensitivity is a measurement of the galvanometer deflection with respect to the open circuit voltage of the driving source, when the resistive impedance of the driving source equals the required external damping resistance of the galvanometer.
- In the case of fluid-damped galvanometers, the voltage sensitivity is that of the galvanometer only as applied to its terminals.
- The voltage sensitivity values are nominal and can vary with the accumulated tolerances of the galvanometer resistance, the external damping resistance, and the current sensitivity.
- Special balance available at small additional cost.
- Linearity is defined with respect to the best straight line through all deflection points obtained from equal increments

of DC current applied to the galvanometer when the light source and zero spot deflection are located 12 inches directly in front of the galvanometer.

- The damping of the fluid-filled galvanometers is controlled almost entirely by the viscosity of the fluid and, therefore, may be considered independent of circuit impedances.
- The frequency response characteristic of the integrating galvanometer exhibits a 6 db per octave slope between the frequencies of 10 cps to 1000 cps within $\pm 5\%$. The response is therefore inversely proportional to frequency in this range.
- The integrating galvanometer is fluid damped and any external circuit resistance greater than 50 ohms can be used without significantly affecting the frequency response.
- The dummy galvanometer contains magnetic characteristics equivalent to an active galvanometer and should be used in any unused channel of the Model 158 Magnet Structure to maintain uniform flux calibration when the instrument will be exposed to extreme environmental conditions. Molded magnetic flux plugs are supplied with all oscilloscopes to maintain flux density and protect against internal magnet structure contamination when the instrument is used under normal service conditions.

Specifications subject to change without notice.

MIDWESTERN

GALVANOMETER
CARRIERS
model 112A



MODEL 112A
CARRIER

These Carrier Frames will adapt Midwestern Galvanometers for use in Magnetic Structures of Consolidated Electrodynamics Corp. Oscillographs.

Each Carrier incorporates insulated contacts which connect with the Galvanometer at assembly and brings them out to terminals located on top of the Carrier. The insulation resistance between the Galvanometer body and the Carrier is 1000 megohms or better, which isolates the Galvanometer from the Magnetic Structure.

When Midwestern Galvanometers are placed in any flux density other than the Midwestern standard, their characteristics are affected to a degree determined by the new flux density.

The chart below gives the characteristics of the Midwestern Galvanometers when placed in a Consolidated Electrodynamics Magnetic Structure using a Midwestern Model 112A Carrier.

PERFORMANCE CHARACTERISTICS

GALVANOMETER TYPE IN 112A CARRIER (2)	UNDAMPED NATURAL FREQUENCY (cps)	FLAT ($\pm 5\%$) FREQUENCY RANGE (cps) (1)	EXTERNAL DAMPING RESISTANCE (ohms) (1)	NOMINAL INTERNAL RESISTANCE (ohms)	DC SENSITIVI- TY AT 11.5-IN. OPTICAL ARM Ma/Inch	STATIC BALANCE AT 11.5-INCH OPTICAL ARM Inch/"G"	MAXIMUM SAFE CURRENT Ma DC
MAGNETICALLY-DAMPED GALVANOMETERS							
102A-40	40	0- 24	448	33	.0037	.120	10
102A-60	60	0- 36	449	39	.0065	.070	10
102A-100	100	0- 60	291	34	.0091	.030	25
102-150	150	0- 90	190	32	.0196	.030	25
102-200	200	0-120	133	30	.0364	.030	50
102-300	300	0-180	107	24	.1176	.030	50
102-400	400	0-240	56	24	.211	.030	50
102-500	500	0-300	35	30	.343	.030	50
126-100	100	0- 60	157	27	.0099	.030	10
126-101	100	0- 60	451	46	.0066	.030	10
126-200	200	0-120	160	36	.0261	.030	10
126-201	200	0-120	458	72	.0224	.030	10
126-300	300	0-180	163	50	.0476	.030	10
126-301	300	0-180	452	51	.0607	.030	10
FLUID-DAMPED GALVANOMETERS							
102-900	900	0-540	NONE	25	3.5	.010	100
102-1000	1000	0-600	NONE	25	4.3	.010	100
102-1500	1500	0-900	NONE	17	10.0	.010	100
102-2000	2000	0-1200	NONE	17	16.3	.010	150
102-3000	3000	0-1800	NONE	14	38.3	.010	150
120B-3.5K	3500	0-2100	NONE	43	18.1	.010	100
120B-5K	5000	0-3000	NONE	43	30.3	.010	100
120B-8K	8000	0-5000	NONE	43	63.4	.010	100
120B-10K	10000	0-6000	NONE	43	63.4	.010	100
HIGH-FREQUENCY GALVANOMETERS							
131-15000	15000	cps USEFUL RANGE	NONE	105	86.0	.004	32
NOTES: (1) The frequency response can be adjusted to be flat to 60% of the natural frequency with a suitable damping resistance. (2) Standard focal length of galvanometers is 5.5 inches. Special focal lengths available when specified.							

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